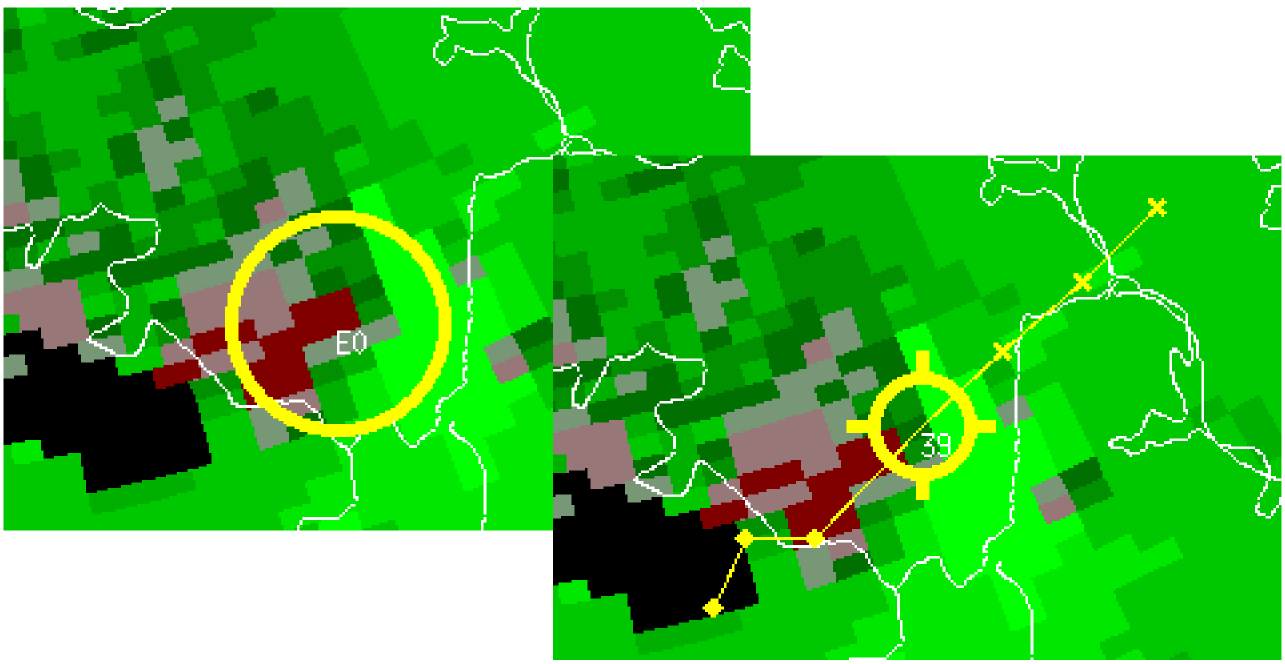
RPG Build 6 Training



Presented by the

Warning Decision Training Branch

Version: 0409

Overview

RPG build upgrades continue on a six month delivery schedule, with RPG Build 6 deployment beginning in late September, 2004. Each RPG build has a blend of new science, upgrades to existing products or algorithms, as well as fixes. Features such as new products associated with each RPG build will become available for display and request to NWS forecasters at the AWIPS workstation. The timing of AWIPS implementation of new RPG products will vary, dependent upon the contents and deployment schedule of subsequent AWIPS builds.

This document will present highlights of the operationally relevant changes with RPG Build 6. Some of these changes will be apparent at the RPG Human Computer Interface (HCI). However, the ability to see other changes depends on upgrades to the AWIPS software.

Note: The AWIPS images in this document were captured from a pre-release version of AWIPS OB 4.0. There may be some differences between these images and comparable ones from the deployed version of AWIPS OB 4.0.

The following features of RPG Build 6 will be presented in this document:

1. Adaptable Parameter Design Change
2. Snow Accumulation Algorithm (SAA) #
3. Mesocyclone Detection Algorithm (MDA) Phase 2 *
4. Change to lowest Layer Composite Reflectivity Maximum (LRM) product
5. Option to reset precipitation accumulations

6. Changes to support real-time Level II Data Collection

7. Correction to Gage Bias Table ingest

8. Compression of DR, DV, and DHR products

9. Parameter change to EET product

10. MPDA adaptable parameters and EPRE Exclusion Zones

11. Build 6 Actions**

SAA products are currently scheduled for display in AWIPS OB 6.0 (August 2005).

* MDA Phase 2 products will be displayable in AWIPS OB 4.0 (August 2004).

**Actions affect all NWS offices, including those operating FAA Redundant systems

Electronic Performance Support System (EPSS)

The Electronic Performance Support System (EPSS) has been updated to support the Build 6 changes that are apparent on the RPG Human Computer Interface (HCI).

1. Adaptable Parameter Design Change

For each of the Algorithms selected at the Algorithms window at the RPG, only those parameters which have URC change authority will be displayed. Thus the only parameters that you can see are those that are editable.

As an example, compare the upper portion of the Build 5 version (Figure 1) vs. the Build 6 version (Figure 2) of the parameters window for the Hydromet Preprocessing algorithm. In each case, the URC editable parameters are highlighted in blue once the password is provided. With Build 6, only the parameters that are URC editable are displayed on the window.

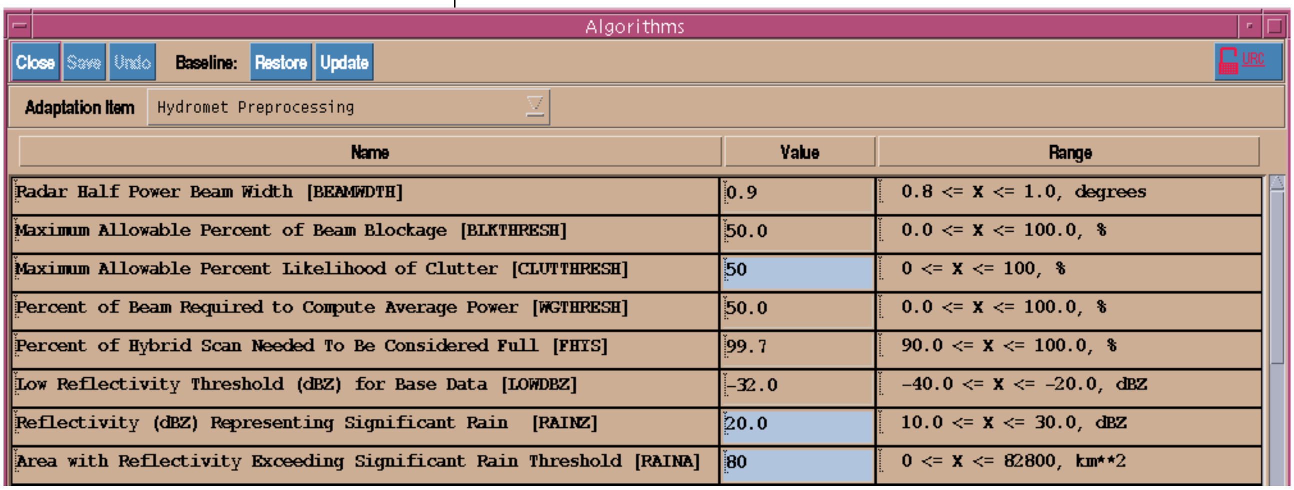


Figure 1. Build 5 version of the Algorithms window for Hydromet Preprocessing.

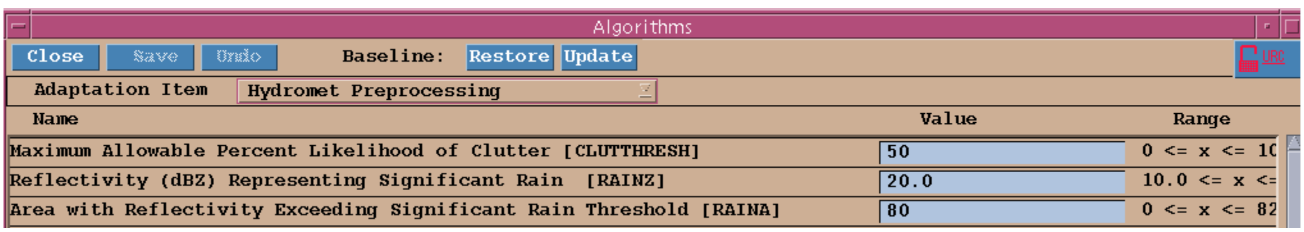


Figure 2. Build 6 version of the Algorithms window for Hydromet Preprocessing.

2. Snow Accumulation Algorithm (SAA)

The Snow Accumulation Algorithm (SAA) was developed at 6 different locations: Albany, NY; Cleveland, OH; Minneapolis, MN; Denver, CO; Grand Junction, CO; Reno, NV. At each of these sites, a network of high quality snow gages was used as ground truth to develop S-Z relationships and other parameters for each of six geographic regions.

References

For a report on the design of the SAA:

Super, A. B., and E. W. Holyroyd; 1998: Snow accumulation algorithm for the WSR-88D: Final Report. Bureau of Reclamation Report R-98-05, Denver, CO, July, 77pp.

For an evaluation of the SAA:

Cairns, M., M. Fresch, L. Osterman, and S. Otteson, 1999: Assessment of a real-time snow accumulation algorithm at Reno, Nevada. 29th Conf. on Radar Meteor., Montreal, Quebec, Canada, Amer. Meteor. Soc., 798-801.

SAA Design

The SAA has a general design similar to the more familiar Precipitation Processing Algorithms for rainfall. However, there are some significant differences which will be presented.

An important element to remember is that the SAA was designed for use with dry snow events, meaning snow that is not melting as it falls or when it reaches the ground. The SAA products generated with Build 6 depict snow depth and snow water equivalent. The durations are one hour, storm total and user selectable.

The SAA relies on the Enhanced Precipitation Preprocessing (EPRE) algorithm for input. The EPRE, implemented in RPG Build 5, is the portion of Precipitation Processing that builds the Hybrid Scan. Reflectivity values from the Hybrid Scan are used by the SAA for processing into the snow products.

Begin and End of Snowfall Accumulations

The SAA does ***not*** have a function that begins and ends snow accumulations based on a set of parameters. With the rainfall products, once there is a one hour period with no rainfall, the product accumulations automatically reset to zero. The only automatic reset for the snow accumulations occurs if there is a greater than 30 hour jump in time (e.g. a lengthy RDA or wideband outage). Otherwise, the snow accumulations are ***always*** running, and the design requires a reset to begin new accumulations prior to an anticipated snow event. This design was chosen since snow products are expected to be of interest only for specific events.

In order to use the snow products for a winter storm, the snow accumulations must be reset and RPS lists with the desired snow products must be invoked prior to the event.

Reset (Begin) the Snow Accumulations

The snow accumulations reset is done at the RPG starting from the RPG Control window. It is *not* necessary to do a RPG Shutdown to reset the snow accumulations. The reset is part of the Options button under Restart (Figure 3).

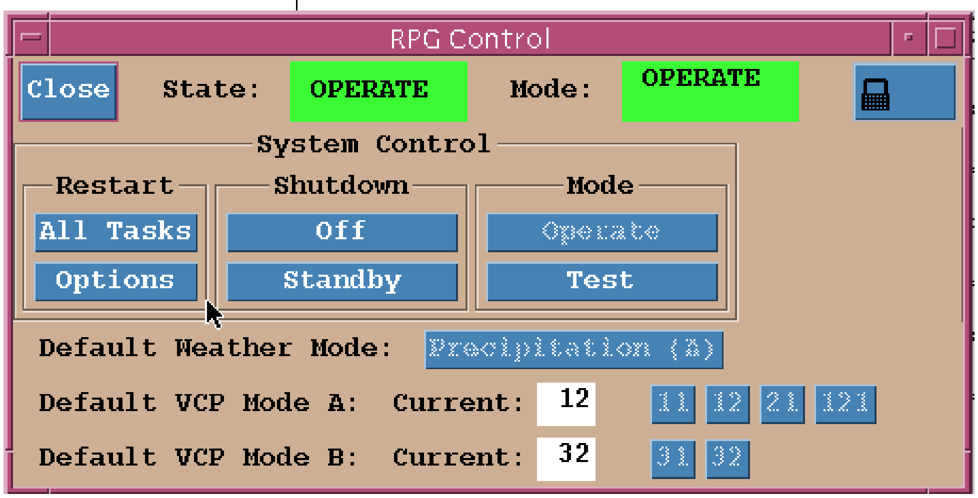


Figure 3. RPG Control Window. To reset the snow accumulations, select Options in the Restart area.

Selecting the Options button under Restart will bring up the RPG Init Options window. In this window, the URC password must first be provided. The Reset Snow Accumulation option is then selected, followed by the Activate Button (Figure 4).

Volume Scans Always Used

The Precipitation Processing algorithms have a check for bad data for each volume scan, such as intermittent AP or point clutter contamination. If a particular scan is flagged as bad, the dBZs from that scan are not used in the rainfall accumula-

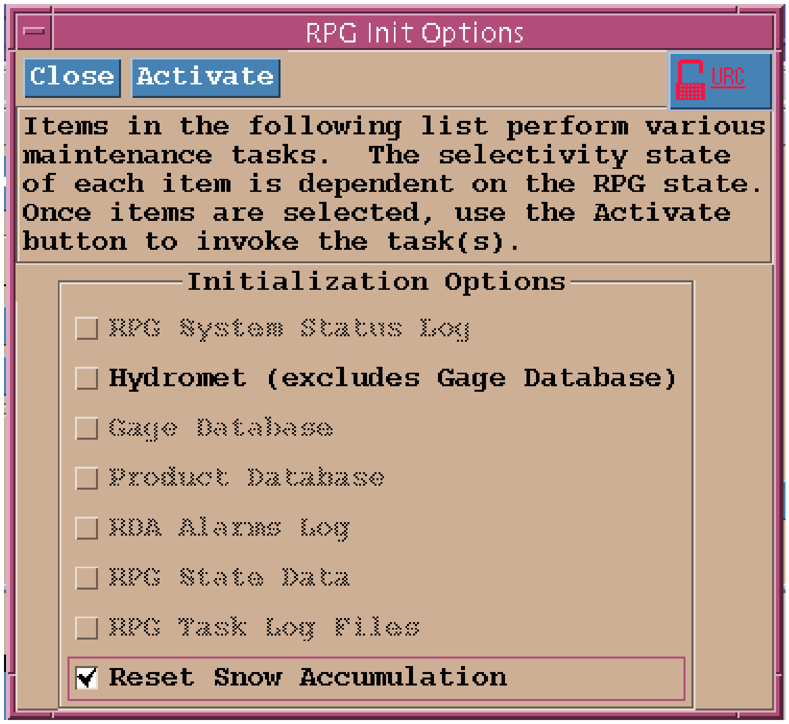


Figure 4. RPG Init Options Window. After providing the URC password, select Reset Snow Accumulation, then Activate.

tions. Though the SAA does not have an analogous bad scan check, AP is unlikely during winter storms, and the SAA does have a point clutter filter.

Converting Reflectivity to the Rate of Snow Water Equivalent

The Base Reflectivity values (Z) from the EPRE Hybrid Scan are converted to rate of snow water equivalent (S) using a Z-S relationship. As with the Z-R relationship for rainfall, there are two coefficients, the multiplicative and the power.

$$Z = (multiplicative) \times S^{(power)}$$

Decreasing (increasing) the multiplicative coefficient will increase (decrease) the snow water equivalent rate S. Decreasing (increasing) the power coefficient will increase (decrease) the slope of the increase in S with greater reflectivity.

With Build 6, the Z-S relationships used initially are region dependent, based on research conducted at a representative site for each region. The following regions and associated coefficients will form the set of defaults. Each site will initially get one of the following Z-S relationships as the default.

1. Northeast (Albany, NY), $Z = 120\ S^2$
2. Great Lakes (Cleveland, OH), $Z = 180\ S^2$
3. Northern Plains/Upper Midwest (Minneapolis, MN), $Z = 180\ S^2$
4. High Plains (Denver, CO), $Z = 130\ S^2$
5. Inter-mountain West (Grand Junction, CO), $Z = 40\ S^2$
6. Sierra Nevada (Reno, NV), $Z = 222\ S^2$

For southern states and OCONUS sites, the default Z-S will be from the Northeast region. The Z-S parameters are editable under URC guidelines and any of these Z-S relationships may be used by a particular office.

Range/Height Correction

A feature of the SAA that is currently not available with Precipitation Processing for rainfall is correcting for underestimations at longer ranges. Underestimation is particularly relevant for snow events, which typically are low-topped. The SAA applies a range/height correction to S, the rate of snow water equivalent.

Above a minimum height, the correction is applied to the value of S and increases with range/height. The equation is non-linear (quadratic), and uses three coefficients which are also regional default adaptable parameters.

This type of range/height correction will be labeled on the products as “static”, since it is a fixed correction for any particular range. A “dynamic” range/height correction, based on the real time Vertical Reflectivity Profile, is planned for implementation in a later build.

Snow Ratio

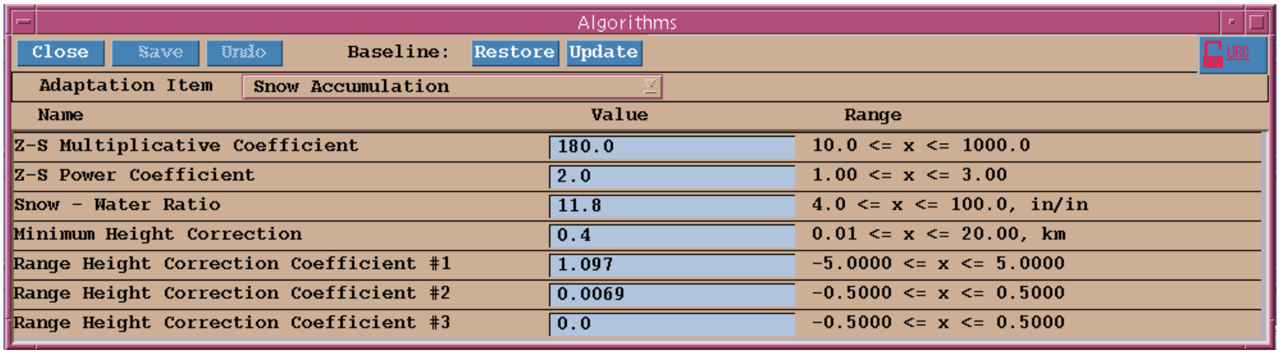
Once the range height correction is applied to S, the rate of snow depth, SD, is computed. SD is calculated by multiplying S by the Snow Water Ratio, a regional adaptable parameter. Based on results from the development of the SAA, the following regional Snow Ratios will be the defaults.

1. Northeast (Albany, NY): 11.8
2. Great Lakes (Cleveland, OH): 16.7
3. Northern Plains/Upper Midwest (Minneapolis, MN): 11.8
4. High Plains (Denver, CO): 13.3
5. Inter-mountain West (Grand Junction, CO): 14.3
6. Sierra Nevada (Reno, NV): 8.0

The Snow Ratio is also editable under URC guidelines. During the SAA development, the NWS Forecast Office in Albany found snow ratios of 20 for lake effect snow and 13 for Nor’easters. During arctic outbreaks in the Northern Plains/Upper Midwest, the snow ratio can be 30 or higher.

SAA Adaptable Parameters

The SAA has seven adaptable parameters which are editable under URC guidelines. Since the parameters differ by region, each WSR-88D site will receive a set of parameters representative of one of the six regions.



Name	Value	Range
Z-S Multiplicative Coefficient	180.0	10.0 <= x <= 1000.0
Z-S Power Coefficient	2.0	1.00 <= x <= 3.00
Snow - Water Ratio	11.8	4.0 <= x <= 100.0, in/in
Minimum Height Correction	0.4	0.01 <= x <= 20.00, km
Range Height Correction Coefficient #1	1.097	-5.0000 <= x <= 5.0000
Range Height Correction Coefficient #2	0.0069	-0.5000 <= x <= 0.5000
Range Height Correction Coefficient #3	0.0	-0.5000 <= x <= 0.5000

Figure 5. SAA adaptable parameters editable under URC guidelines.

The SAA parameters in Figure 5 are an example from the Northern Plains/Upper Midwest region, based on research conducted at Minneapolis, MN. WSR-88D sites within this region will have this set of parameters delivered with Build 6.

SAA Products

There are six new products with the SAA. They have a resolution of 1° by .54 nm to a range of 124 nm, with 16 data levels and an associated alpha-numeric product. The two product types are snow water equivalent and snow depth, while the three durations are one hour, storm total, and user selectable.

1. OSW - One Hour Snow Water Equivalent
2. OSD - One Hour Snow Depth
3. SSW - Storm Total Snow Water Equivalent
4. SSD - Storm Total Snow Depth
5. USW - User Selectable Snow Water Equivalent
6. USD - User Selectable Snow Depth

The snow products are currently scheduled to be displayable with AWIPS OB 6.0 (August 2005). ***The example snow products in this document come from a development workstation.***

One Hour Snow Water Equivalent (OSW)

The OSW is updated each volume scan and displays the snow water equivalent in hundreths of inches for one hour ending at the current volume scan time (Figure 6).

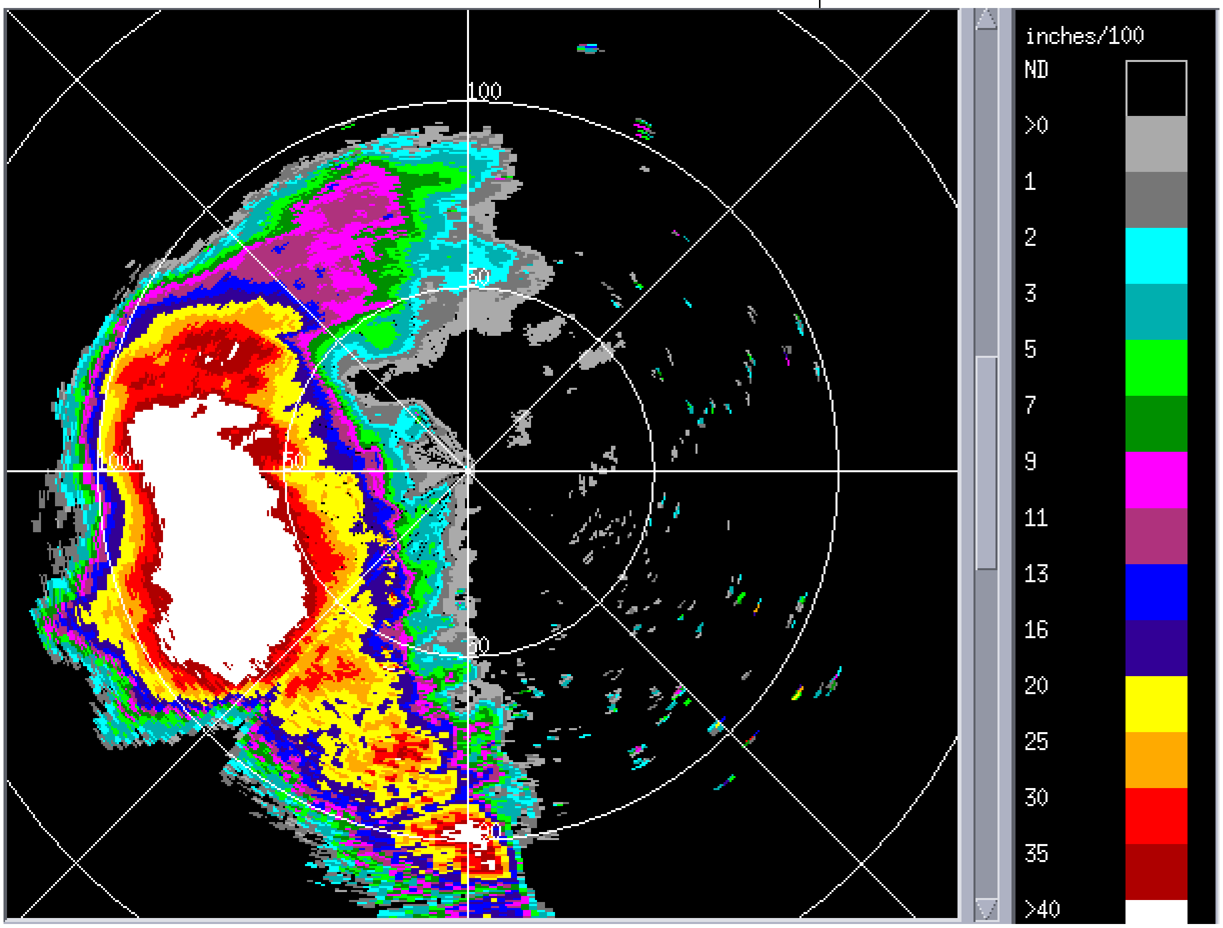


Figure 6. One Hour Snow Water Equivalent product, OSW.

There is also an alphanumeric version of the OSW (Figure 7).

```
ONE HOUR SNOW WATER EQUIVALENT ACCUMULATION (OSW)

RPG Name: KCRI     Date: 02/07/1999     Time: 13:06Z

Starting Date:................      02/07/1999
Starting Time:................      12:02Z
Ending Date:..................      02/07/1999
Ending Time:..................      13:06Z
Maximum Snow Water Equivalent:      0.636 inches
Azimuth of Maximum Value:.....      283 degrees
Range to Maximum Value:.......       62 nautical miles
Range/height Correction Applied:    Static
Missing Time..................        0 minutes
```

Figure 7. Alphanumeric One Hour Snow Water Equivalent product, OSW.

One Hour Snow Depth (OSD)

The OSD is updated each volume scan and displays the snow depth in inches for one hour ending at the current volume scan time (Figure 8).

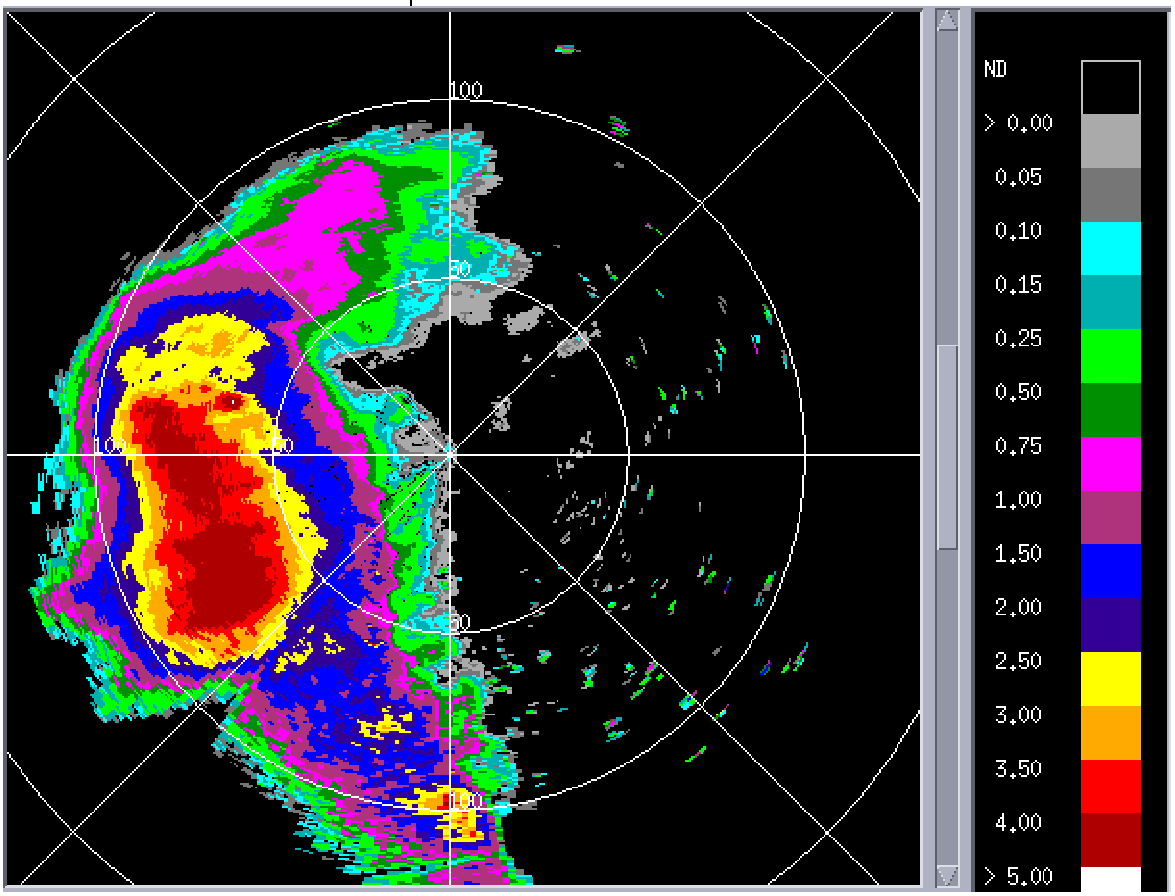


Figure 8. One Hour Snow Depth product, OSD.

There is also an alphanumeric version of the OSD (Figure 9).

```
              ONE HOUR SNOW DEPTH ACCUMULATION (OSD)

    RPG Name: KCRI     Date: 02/07/1999     Time: 13:06Z

   Starting Date:................     02/07/1999
   Starting Time:................     12:02Z
   Ending Date:..................     02/07/1999
   Ending Time:..................     13:06Z
   Maximum Snow Depth:...........     5.09 inches
   Azimuth of Maximum Value:.....     283 degrees
   Range to Maximum Value:.......      62 nautical miles
   Range/height Correction Applied:   Static
   Missing Time..................       0 minutes
```

Figure 9. Alphanumeric One Hour Snow Depth product, OSD.

Storm Total Snow Water Equivalent (SSW)

The SSW is updated each volume scan and displays the snow water equivalent since the SAA accumulations were last reset (Figure 10).

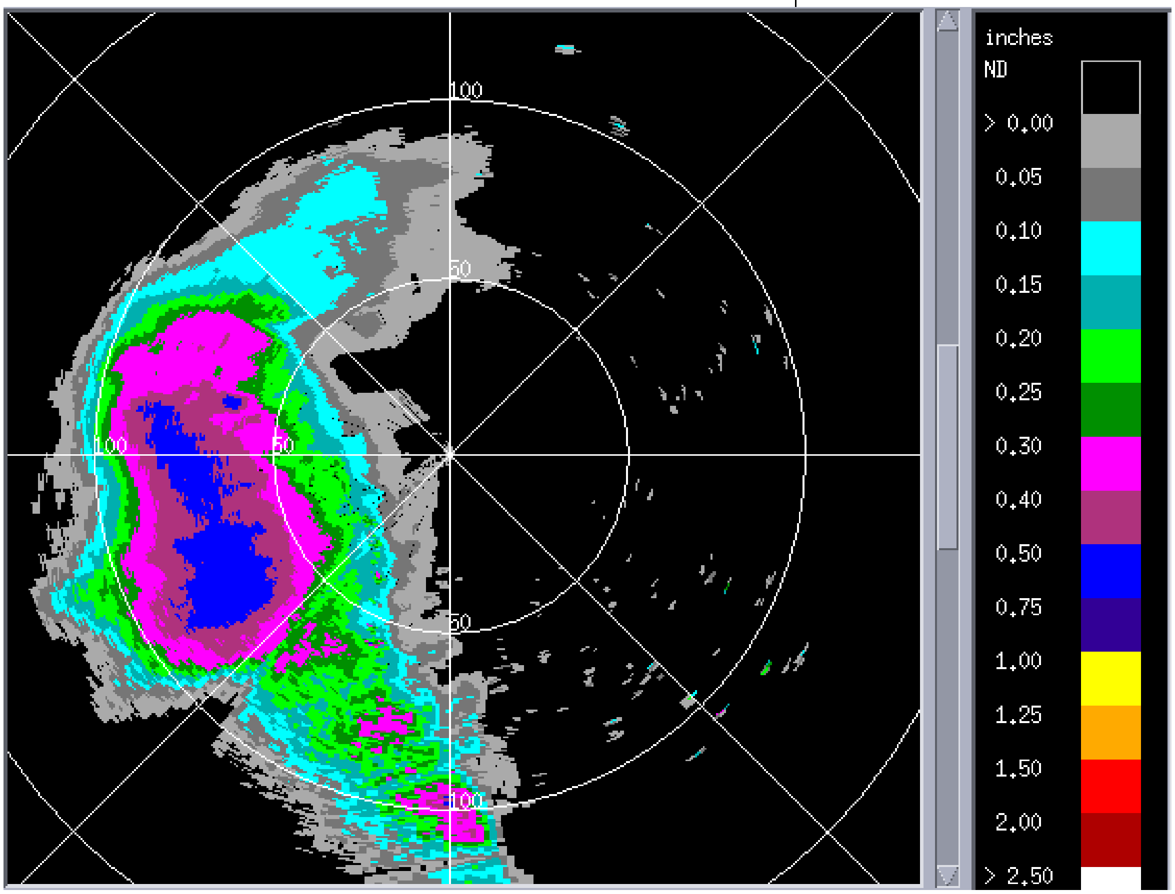


Figure 10. Storm Total Snow Water Equivalent (SSW).

There is also an alphanumeric version of the SSW (Figure 11).

```
        STORM TOTAL SNOW WATER EQUIVALENT ACCUMULATION (SSW)

 RPG Name: KCRI    Date: 02/07/1999    Time: 13:06Z

Starting Date:...............    02/07/1999
Starting Time:...............    12:02Z
Ending Date:.................    02/07/1999
Ending Time:.................    13:06Z
Maximum Snow Water Equivalent:   0.63 inches
Azimuth of Maximum Value:.....   283 degrees
Range to Maximum Value:.......    62 nautical miles
Range/height Correction Applied: Static
Missing Time.................      0 minutes
```

Figure 11. Alphanumeric Storm Total Snow Water Equivalent (SSW).

Storm Total Snow Depth (SSD)

The SSD is updated each volume scan and displays the snow depth since the SAA accumulations were last reset (Figure 12).

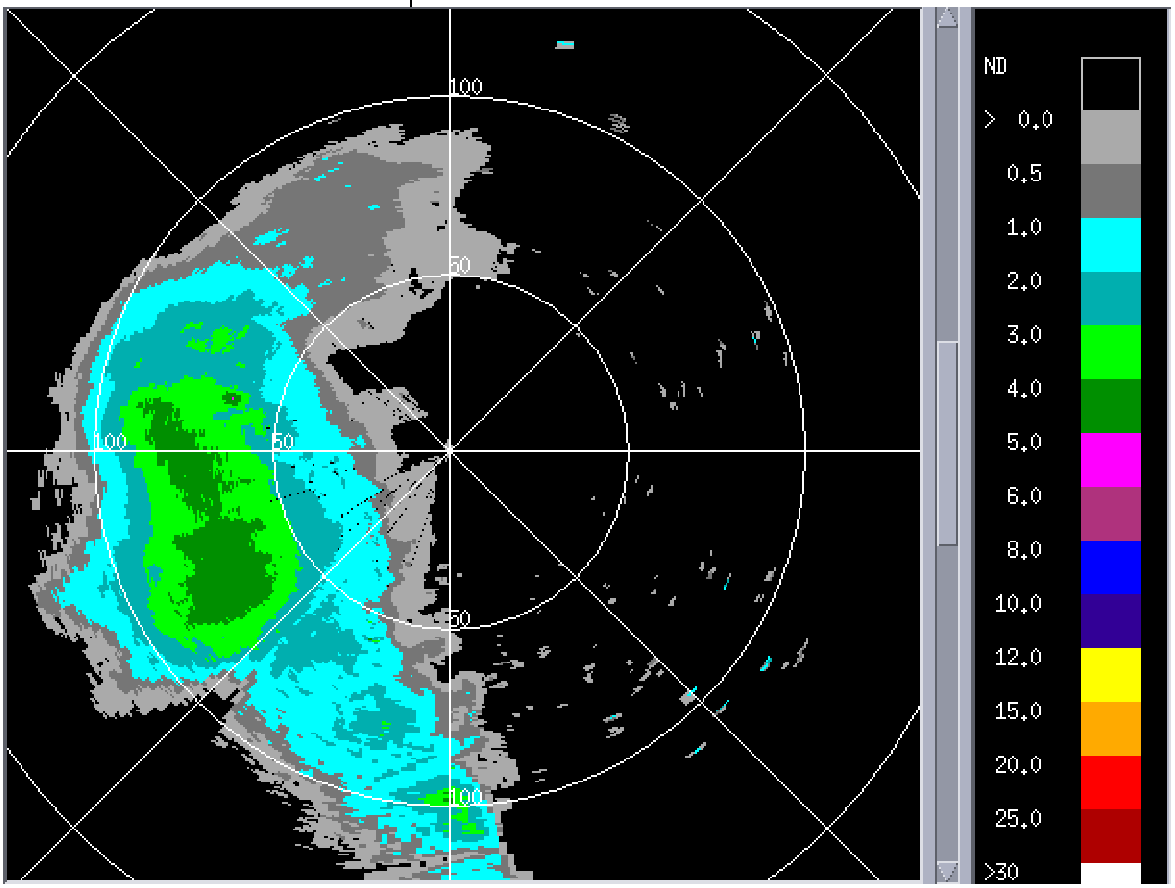


Figure 12. Storm Total Snow Depth (SSD).

There is also an alphanumeric version of the SSD (Figure 13).

```
            STORM TOTAL SNOW DEPTH ACCUMULATION (SSD)

 RPG Name: KCRI     Date: 02/07/1999     Time: 13:06Z

Starting Date:................    02/07/1999
Starting Time:................    12:02Z
Ending Date:..................    02/07/1999
Ending Time:..................    13:06Z
Maximum Snow Depth:...........     5.0 inches
Azimuth of Maximum Value:.....    283 degrees
Range to Maximum Value:.......     62 nautical miles
Range/height Correction Applied:  Static
Missing Time..................      0 minutes
```

Figure 13. Alphanumeric Storm Total Snow Depth (SSD).

User Selectable Snow Water Equivalent (USW)

The USW is based on hourly snow water equivalent accumulations, which end at the top of the hour (Figure 14). The number of hours used and end time for the accumulations must be specified.

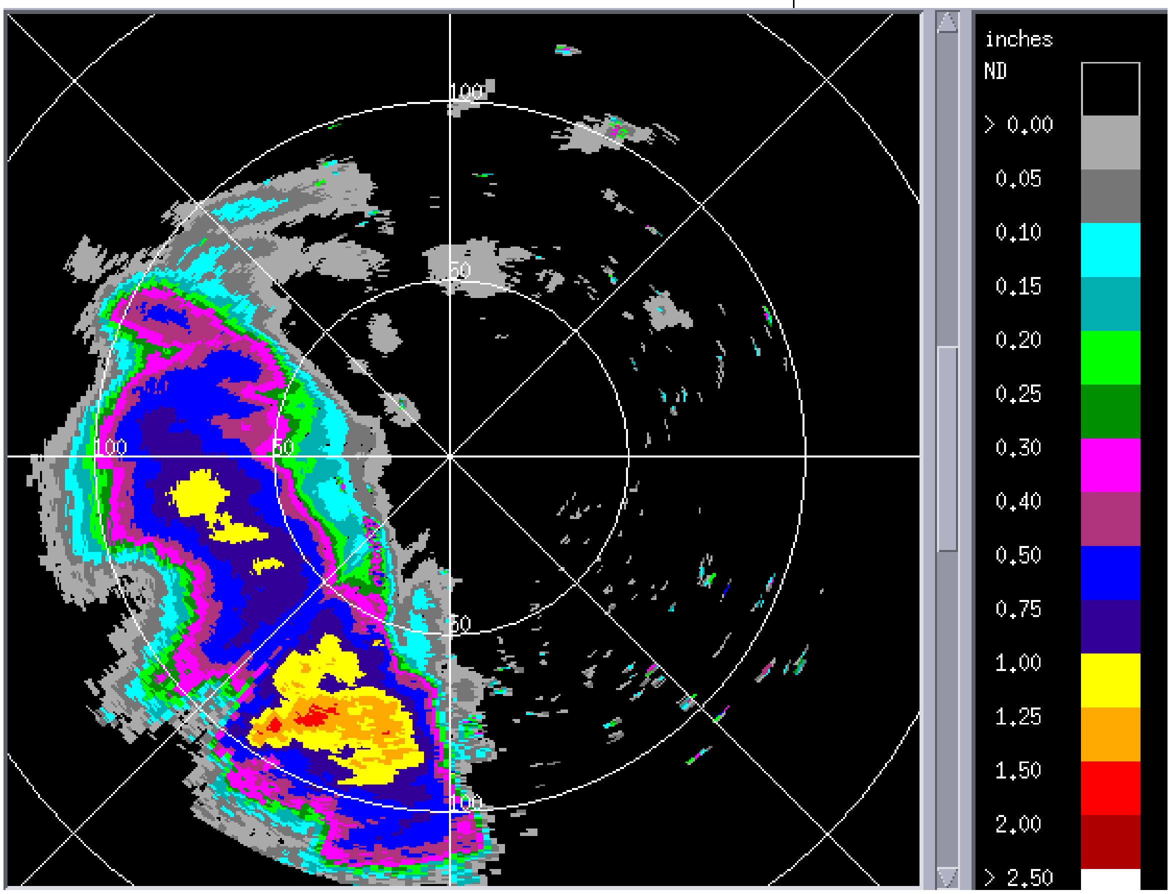


Figure 14. User Selectable Snow Water Equivalent (USW).

There is also an alphanumeric version of the USW (Figure 15).

```
     USER SELECTABLE SNOW WATER EQUIVALENT ACCUMULATION (USW)

 RPG Name: KCRI     Date: 02/07/1999     Time: 11:03Z

Starting Date:...............       02/07/1999
Starting Hour:...............       09:06Z
Ending Date:.................       02/07/1999
Ending Hour:.................       11:03Z
Maximum Snow Water Equivalent:       1.71 inches
Azimuth of Maximum Value:.....      207 degrees
Range to Maximum Value:.......       84 nautical miles
Range/height Correction Applied:    Static
End Hour Requested:...........       11Z
No. of Hours Requested:.......        3
Available Hours:..............        3
09Z 10Z 11Z
```

Figure 15. Alphanumeric User Selectable Snow Water Equivalent (USW).

User Selectable Snow Depth (USD)

The USD is based on hourly snow depth accumulations, which end at the top of the hour (Figure 16). The number of hours and end time for the accumulations must be specified.

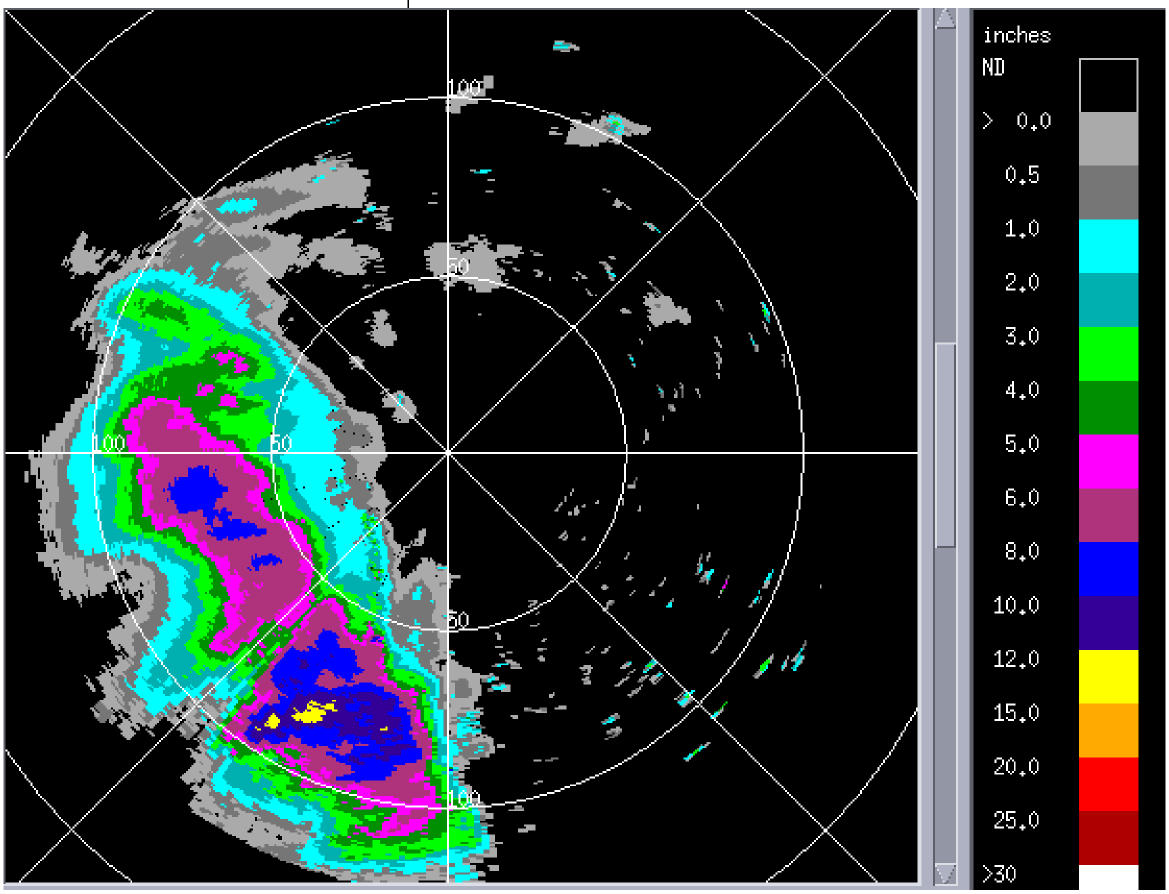


Figure 16. User Selectable Snow Depth (USD).

There is also an alphanumeric version of the USD (Figure 17).

```
        USER SELECTABLE SNOW DEPTH ACCUMULATION (USD)

    RPG Name: KCRI     Date: 02/07/1999     Time: 11:03Z

   Starting Date:...............     02/07/1999
   Starting Hour:...............     09:06Z
   Ending Date:.................     02/07/1999
   Ending Hour:.................     11:03Z
   Maximum Snow Depth:..........     13.70 inches
   Azimuth of Maximum Value:....     207 degrees
   Range to Maximum Value:......      84 nautical miles
   Range/height Correction Applied:  Static
   End Hour Requested:..........      11Z
   No. of Hours Requested:......       3
   Available Hours:.............       3
   09Z 10Z 11Z
```

Figure 17. Alphanumeric User Selectable Snow Depth (USD).

3. Mesocyclone Detection Algorithm (MDA) Phase 2

Phase 1 of the Mesocyclone Detection Algorithm was implemented with RPG Build 5. However, this has been transparent to NWS users since the MDA products have not yet been displayable in AWIPS. The MDA products are scheduled for display with AWIPS OB 4.0.

Reference

For a more detailed discussion of MDA design than will be presented here, see:

G. Stumpf, A. Witt, E. Mitchell, P. Spencer, J. Johnson, M. Eilts, K. Thomas, and D. Burgess, 1998: The National Severe Storms Laboratory Mesocyclone Detection Algorithm for the WSR-88D. Weather and Forecasting, 13, 304-326.

MDA Performance

This paper also presents statistics on MDA performance compared to the legacy Mesocyclone algorithm. In comparing data sets, MDA has outperformed the legacy Mesocyclone algorithm in identifying tornadic circulations. MDA was shown to have a higher Critical Success Index (CSI) and Heidke Skill Score (HSS), primarily due to a lower false alarm rate.

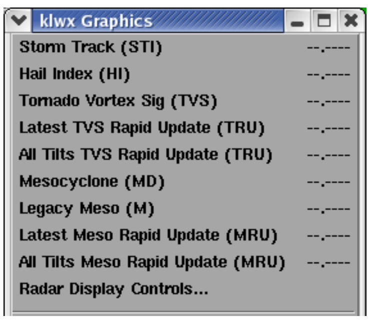
MDA Design

Compared to the legacy Mesocyclone algorithm, the MDA will detect a broader spectrum of circulations. The MDA features added with RPG Build 6 include tracking (past and future positions) of identified circulations. The Build 6 version of MDA also includes the Digital Mesocyclone Detection (DMD) product, which provides rapid update capability and an extensive attribute table. More of the DMD information will be displayable in future AWIPS builds.

MDA will not replace the legacy Mesocyclone algorithm for several RPG Builds. It is not currently known when the legacy Mesocyclone product will be removed. With Build 6, products from both algorithms will be available, as well as the Rapid Update for the legacy Mesocyclone product (MRU). Also, inputs for Alerting, the Radar Coded Message, and the Combined Attribute Table will continue to come from the legacy Mesocyclone algorithm.

MDA Products

MDA produces an end of volume product and an elevation by elevation data array. The Mesocyclone Detection (MD) product is available at the end of each volume scan, while the Digital Mesocyclone Detection (DMD) data array is available each elevation angle. With RPG Build 6 and AWIPS OB 4.0, the following meso-related products will be available:



- legacy Mesocyclone (M)
  - end of volume scan
- legacy Mesocyclone Rapid Update (MRU)
  - each elevation angle
- Mesocyclone Detection (MD)
  - end of volume scan
- Digital Mesocyclone Detection (DMD)
  - each elevation angle in table format

MDA Processing for a Single Elevation

For a particular elevation angle, MDA searches for shear segments and convergence vectors.

- A shear segment is a string of base velocity bins at a fixed range, where the values increase in a clockwise direction.
- A convergence vector is a string of base velocity bins at a fixed azimuth, where the values decrease in a direction away from the radar.

Minimum Reflectivity

Candidates for shear segments or convergence vectors must have corresponding reflectivity values above a threshold. This threshold is a URC adaptable parameter called the “Minimum Reflectivity”. The default setting is 0 dBZ (Figure 18).

MDA Processing for Multiple Elevation Angles

Shear segments from a single elevation are first combined into 2D features, then checked for strength and aspect ratio. The 2D features are then vertically correlated and initially classified as “circulations”. Each circulation is assigned an ID number, with numbers cycling from 0 to 999.

Strength Rank

A Strength Rank value is assigned to each 3D circulation, based on the strengths of the rotational velocities of its associated 2D features. The Strength Ranks range from 1 as the weakest possible to 25 as the strongest. Any circulation with a Strength Rank of 5 or greater is classified as a Mesocyclone.

MDA Adaptable Parameters

In addition to the Minimum Reflectivity, there are two other MDA adaptable parameters that are editable.

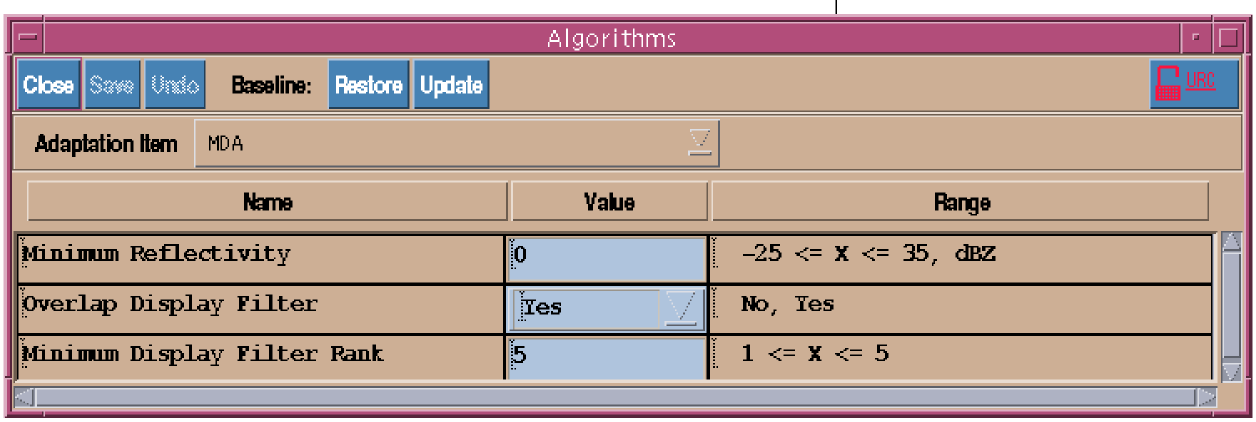


Figure 18. MDA adaptable parameters at the RPG.

Minimum Display Filter Rank

The Minimum Display Filter Rank (Figure 18) identifies which circulations are displayed on the end of volume scan MD product. The default setting is 5, which means that all circulations with a Strength

Rank of 5 or greater would be displayed on the MD product. If this parameter were set to 8 and the strongest circulation detected had a Strength Rank of 5, ***no*** circulations would be displayed.

Overlap Display Filter

This parameter addresses the possibility of two circulations being displayed on a graphical product in the same location, i.e. the circles overlap. If the “Overlap Display Filter” parameter is set to the default value of Yes (Figure 18), the 3D circulation that is detected in the lower elevation angles is the one displayed.

Using the default settings for the three MDA adaptable parameters will result in the end of volume MD product looking as ***similar*** as possible to the legacy Mesocyclone product ***with respect to which circulations are displayed***.

Number of Detections vs. Weaker Circulations

Tornadoes are sometimes produced from small, weak circulations. The default setting of 5 for the Minimum Display Filter Rank is based on MDA performance with large, deep supercells. For environments where mini-supercells are favored, setting the Minimum Display Filter Rank to 3 or 4 is a consideration. Smaller, weaker circulations would then be displayed on the MD product. However, the total number of circulations displayed will increase significantly as the value of this parameter is lowered.

Tracking Features

MDA Phase 2 has a process that attempts to track 3D circulations from one volume scan to the next. At the end of a volume scan, all 3D features are assigned an extrapolated position for the subsequent volume scan based on previous positions. The locations projected from the previous volume scan are then used to try to match to 3D features detected from the current volume scan.

If There is a Match

If a 3D feature is matched for a number of volume scans, the past positions and forecast positions will be displayed. Though similar to the past and forecast positions for a storm centroid generated by the SCIT algorithm, it is important to remember that the past and forecast tracks computed by MDA apply ***only*** to the 3D feature. Circulations are tracked for up to 10 previous volume scans and up to six forecast positions are computed in 5 minute intervals. The number of forecast positions will never exceed the number of past positions.

Once matched, 3D features will appear on both the MD and DMD products.

If There isn't a Match

A 3D feature from a previous volume scan is retained until there is a match to the subsequent volume scan. However, the search to obtain a match does not persist for the entire volume scan. For a 3D feature detected from a previous volume scan, the search persists until the height of the radar beam is 3 km above the base of the feature. Once the radar beam reaches that height, the feature is removed.

Unmatched features will not be shown on the MD product. They may appear on some elevations of the DMD output during the search for a match.

MDA Product Examples

The following product examples came from a pre-deployment version of AWIPS OB 4.0 software. There may be differences between these images and the deployed version of OB 4.0.

More extensive information on the MDA products will be provided with the AWIPS OB 4.0 training.

The MD Product

Legacy Meso vs. the MD Product

The Mesocyclone Detection (MD) product is available at the end of the volume scan, just like the legacy Mesocyclone (M) product. The MD and M products are displayable from the graphics menu (Figure 19). Also on this menu are two entries for the Meso Rapid Update (MRU). The MRU product is based on the ***legacy*** Mesocyclone algorithm information. The elevation by elevation output from the MDA, which is the Digital Mesocyclone Detection (DMD) data array, is displayed from the SCAN menu (page 24).

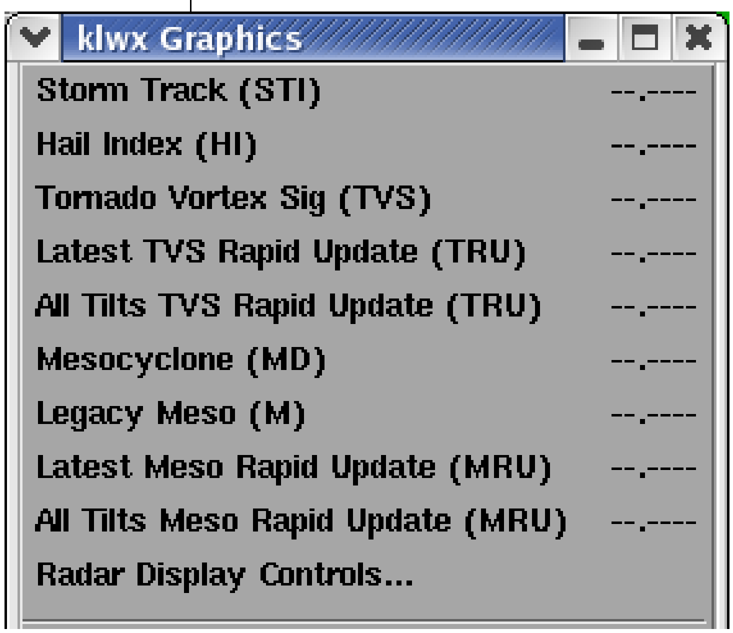


Figure 19. Graphics window with entries to display the MD vs. legacy Meso products.

If the MDA adaptable parameters are set to their default values (Figure 18), the MD product will be as similar as possible to the legacy Mesocyclone product ***with respect to which circulations are displayed***. There are other differences between the MD and M products in the additional information that is displayed.

One significant difference is the inclusion of past and forecast tracks provided by the MD product, as long as there are matches from one volume scan to the next.

Differences in the circle symbols between the two products will be dependent on the setting of the Minimum Display Filter Rank (page 19). On the MD product, a thin yellow circle is used for circulations with a strength rank of 1 through 4, while a thick yellow circle is used for circulations with a strength rank of 5 or above. However, if the Minimum Display Filter Rank is set to the default value of 5, thin circles will ***not*** be seen.

Assuming the same default setting of 5, if a circulation with a strength rank of 5 or above is detected on the lowest elevation angle (or a base is detected at or below 1 km), four spikes are added to the yellow circle. In Figure 20, a low level circulation is depicted on the Legacy Meso product (upper left) and on the MD product (lower right).

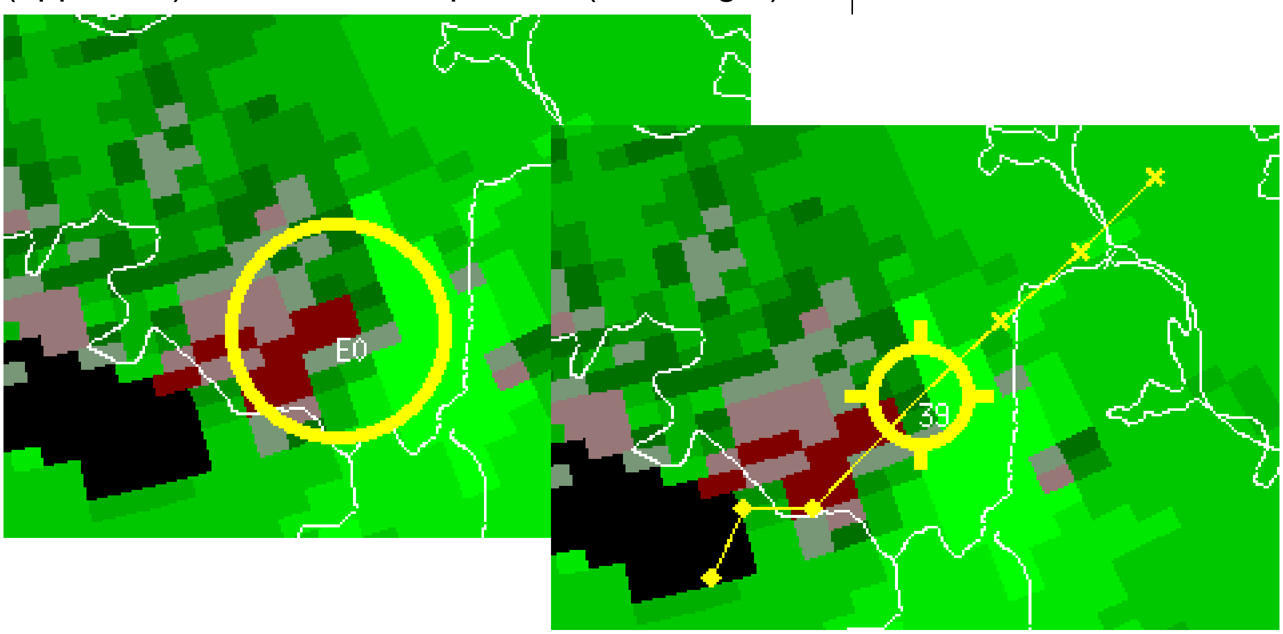


Figure 20. Legacy Mesocyclone (upper left) vs. MD (lower right) product difference in circulation depiction.

MDA assigns a 3 digit identification number to each circulation, ranging from 0 to 999. In Figure 20, the circulation ID for the MD product (lower right) is 39.

As with the legacy M product, the MD product also has an attribute table at the top of the graphical product, and a text version. More information on the attribute table will be included with the AWIPS OB 4.0 training. As of this writing, it is not known if the text version of the MD product will be available with AWIPS OB 4.0.

The DMD Product

With AWIPS OB 4.0, the Digital Mesocyclone Detection (DMD) output will be available through the SCAN suite of products. A table of DMD generated attributes (similar to the traditional SCAN table) can be displayed from the SCAN menu. The entry “Storm DMD Icons & Table” (Figure 21) generates icons on the D2D large pane product and an associated table with extensive attribute information.

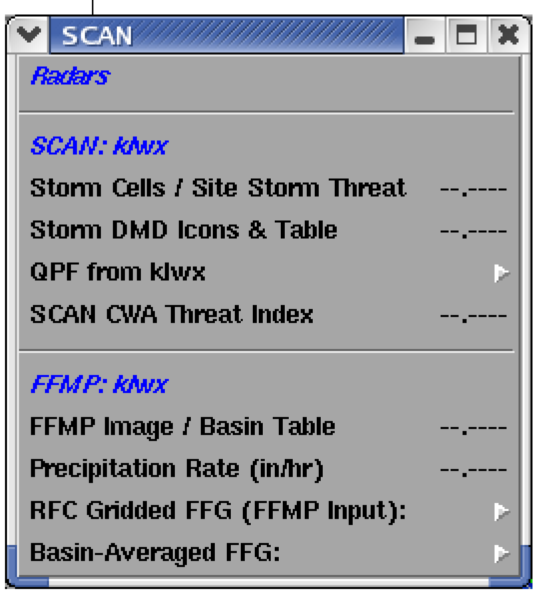


Figure 21. The SCAN menu

The resultant DMD table has features similar to the SCAN table, such as options for displaying and ranking the attributes within the table, trend windows and alarms (Figure 22).

KLWX DMD Table

File: working | Configurations | Rank: default | Attributes | Link to Frame | CWA Filter | Vert | Tips | Elevation: 6.2

ident	azm	rng	stRank	class	msi	tvs	elev0	base	depth	relDep	llDiam	llVr	maxVr	htMxVr	llShr	llgtg	llConv	mlConv	dir	spd	age	strmID
671	288	31	8 L	MESO	5922	Y	Y	2.3	15.4	31	0.6	39	52	11.5	32	36	33	24	203	27	39	A0
674	290	56	8	MESO	5197	N	Y	4.9	33.5	84	2.0	42	52	16.1	12	82	43	33	244	31	39	T3
688	11	12	7	MESO	5094	N	Y	0.7	34.1	80	0.8	12	56	11.8	9	12	30	40	356	12	39	T2
620	211	11	4	circ	3190	N	Y	0.7	23.0	80	2.7	21	34	5.2	4	22	21	22	152	29	49	Z2
927	175	14	4 L	circ	3546	N	Y	1.0	28.2	78	2.2	54	54	1.0	14	70	23	31	35	33	5	Z2

Figure 22. The Storm DMD Table.

More detailed information on the attributes and features of this table is available from the System for Convection Analysis and Nowcasting (SCAN): Digital Mesocyclone Detection (DMD) Guide for Users. This document is available at:

http://www.nws.noaa.gov/mdl/scan/SCANDMD-Guide-Users-OB4.pdf

4. Change to Lowest Layer Composite Reflectivity Maximum (LRM) Product

The Layer Composite Reflectivity Maximum (LRM) products are generated for three layers: low, middle, and high. Prior to Build 6, the layers were

- Low - URC defined to 24,000 ft (Layer 0 and 1)
- Middle - 24,000 to 33,000 ft (Layer 1 and 2)
- High - 33,000 to 60,000 ft (Layer 2 and 3)

These products were originally designed to support the FAA mission. For the past several years, the bottom of the low layer (Layer 0) has been a URC adaptable parameter, while all remaining layer boundaries were uneditable.

With Build 6, the low layer (Layer 0) change authority for the lowest LRM product will be at the ROC level and thus uneditable. The low LRM will be generated from just above radar level to 24,000 ft. For example, for a radar site at 1,600 ft MSL, the bottom of the layer will be at 2,000 ft and the setting for Layer 0 would be 2 (Figure 23).

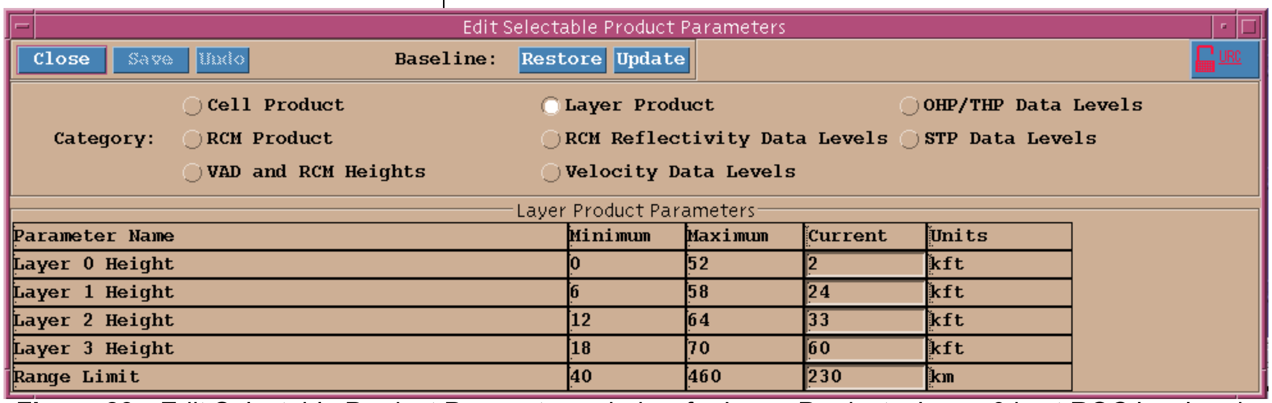


Figure 23. Edit Selectable Product Parameters window for Layer Products. Layer 0 is at ROC level and not editable.

User Selectable LRM (ULR)

If the LRM low product has been used routinely with a higher value for Layer 0, the User Selectable Layer Reflectivity Maximum (ULR) product may be an appropriate substitute. The ULR can have a minimum thickness of 1 kft, with altitudes from 0 to 70 kft. The ULR is also a polar gridded product and has finer resolution than the LRM. In Figure 24, the ULR was generated for the 0 to 5 kft layer.

There is one limitation with the ULR. The RPG will generate up to 10 versions of the ULR per volume scan. However, AWIPS will only store one version per volume scan, the most recent version received. This is expected to be corrected in AWIPS OB 5.0.

5. Option to Reset Precipitation Accumulations

For many locations, the Storm Total Precipitation product can show many days of rainfall accumulations. A quick reset has long been desired and is now available. This reset procedure is similar to the process for resetting the snow accumulations.

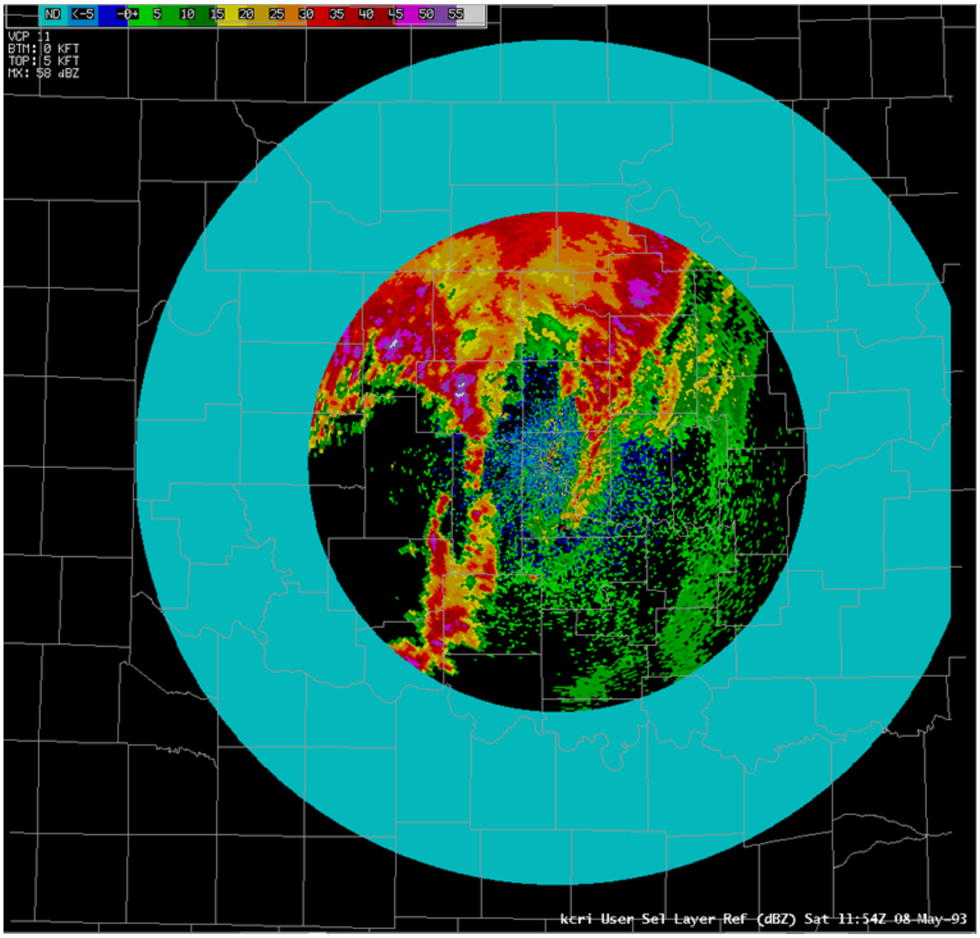


Figure 24. User Selectable LRM for 0 to 5 kft.

Build 6 brings this feature to the RPG as part of the RPG Control window (Figure 25).

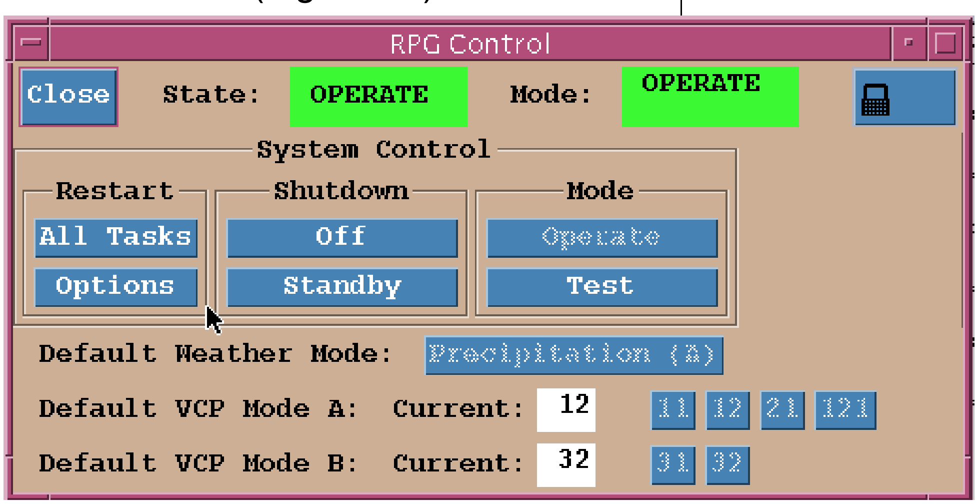


Figure 25. RPG Control Window. To reset the rainfall accumulations, select Options in the Restart area.

It is ***not*** necessary to do an RPG Shutdown to reset the precipitation accumulations. Selecting the Options button under Restart will bring up the RPG Init Options window. In this window, the URC password must first be provided. The Hydromet option is then selected, followed by the Activate button (Figure 26).

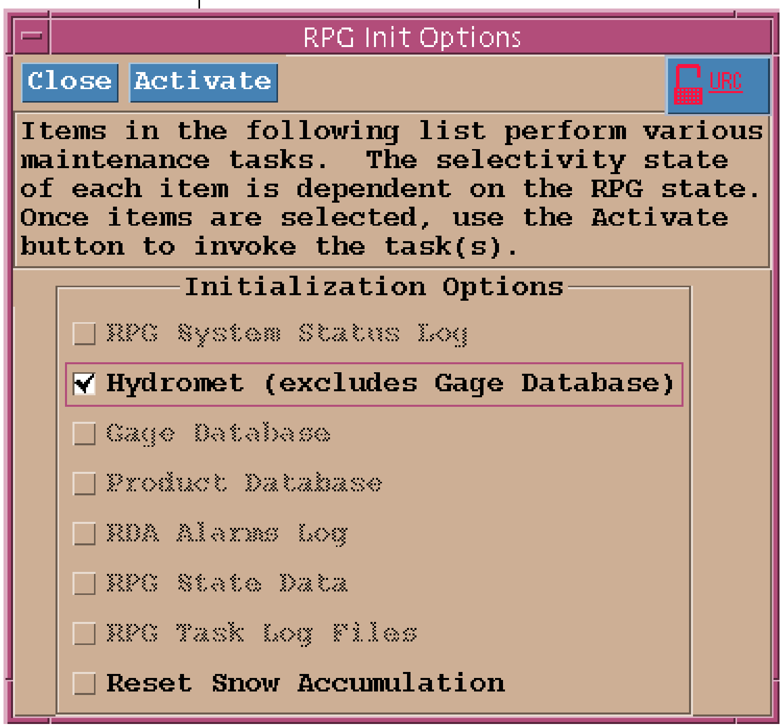


Figure 26. RPG Init Options window. After providing the URC password, select Hydromet, then Activate.

The Hydromet initialization will reset the Storm Total Precipitation product, but will not reset the 30 hour database used to build the User Selectable Precipitation product.

NCA and RAINA

In past years, a "back door" reset of the precipitation accumulations was often performed by setting the Nominal Clutter Area (NCA) to a high value to allow for the assignment of Category 0 and a switch back to Clear Air mode. With the new reset, this method will no longer be needed. In fact, ***it will no longer work*** because of changes made with Build 5!

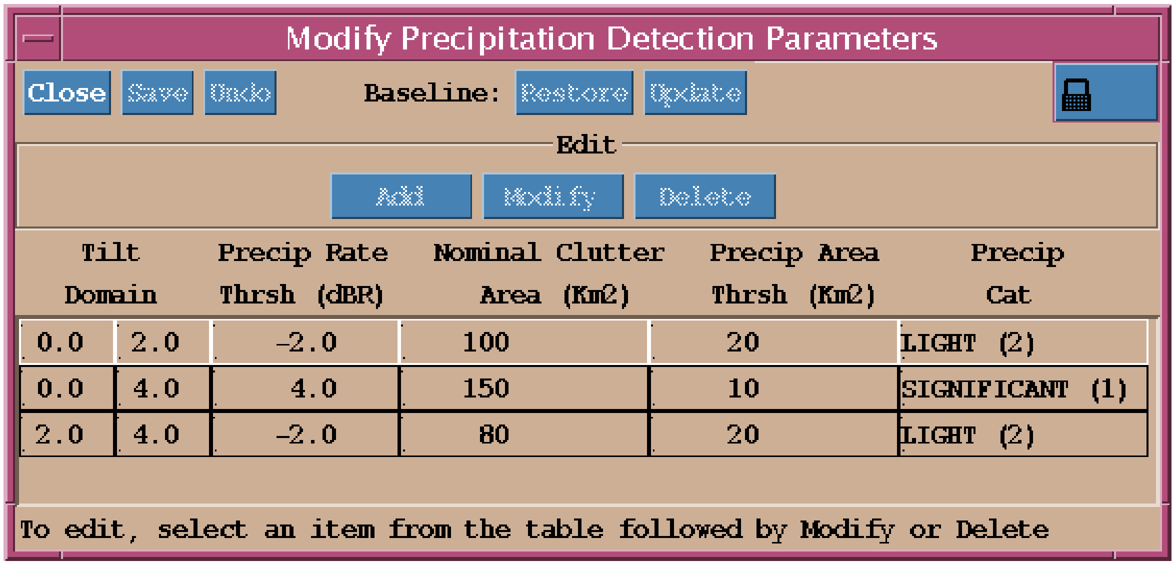


Figure 27. Modify Precipitation Detection Parameters window at the RPG HCI.

With Build 5, the Precipitation Detection Function (PDF) ***stopped*** controlling when precipitation accumulations would begin or end. The NCA still represents the areal coverage of residual clutter, but only impacts VCP control. The PDF ***only*** controls the automatic switch of the radar from a Clear Air mode VCP to VCP 21 when category 1 is assigned. However, this switch will have ***no*** impact on whether the precipitation algorithms are accumulating rainfall (Figure 27).

With Build 5, the function that determines when rainfall accumulations begin and end became part of the Enhanced Precipitation Preprocessing algorithm (EPRE). This function uses adaptable parameters of areal coverage of returns greater than a minimum dBZ value. These parameters are:

- Reflectivity (dBZ) Representing Significant Rain (RAINZ), and
- Area with Reflectivity Exceeding Significant Rain Threshold (RAINA).

The default value for RAINZ is 20.0 dBZ, which is considered to be the lowest dBZ for ***liquid*** precipitable returns.

The default value for RAINA is 80 km^2. For ***most*** locations, this areal coverage will likely be ***too low***, resulting in accumulations in clear air. An appropriate setting representing typical residual clutter will need to be determined locally.

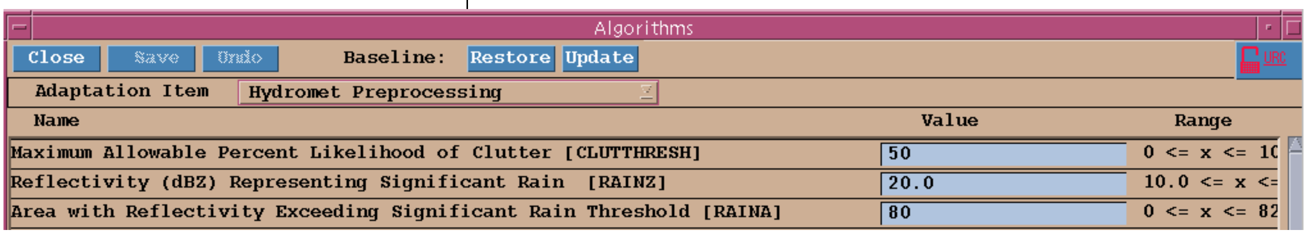


Figure 28. Hydromet Preprocessing (EPRE) adaptable parameters window. Note the areal coverage (RAINA) threshold is set at 80 km^2, likely needing adjustment.

Since the deployment of Build 5, it has been determined that a majority of sites have left RAINA set to the default of 80 km^2. This is a potential cause of precipitation overestimations, since 80 km^2 is a rather small area of residual clutter (Figure 28).

Check and Reset RAINA

Offices are encouraged to check the value of RAINA and ensure that it is representative of the typical areal coverage of residual clutter.

6. Changes to Support Real-time Level II Data Collection

With RPG Build 5, the transition began for all NWS sites to distribute Level II data in real-time to NCDC and other external users. With Build 6, there are some changes at the RPG HCI related to this new way of performing Archive II. Though the Level II data are no longer physically collected on tapes at the RDA, the real-time distribution of Base Data is still considered an Archive II function.

On the main page of the RPG HCI, there is a button to access the window for starting and stopping

Archive II. This button is labeled “Archive II LDM Data” and is attached to the RPG because this task is now performed using hardware and software connected to the RPG (i.e. the Base Data Distribution System (BDDS) computer). LDM stands for Local Data Manager, which is the software used to collect and distribute the Level II data in real-time (Figure 29).

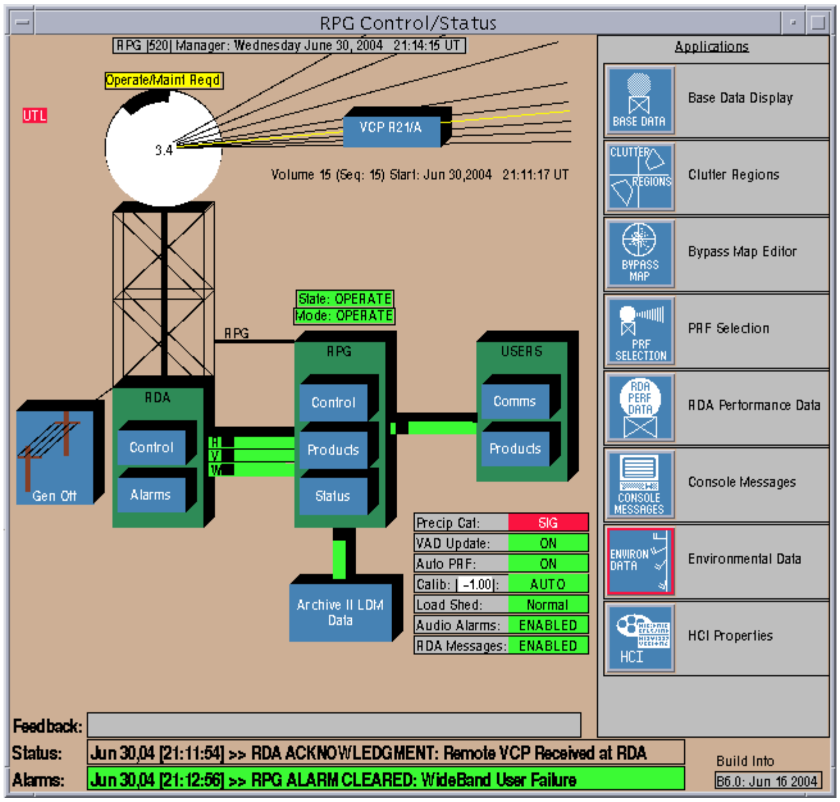


Figure 29. The RPG HCI window with the Archive II LDM Data button.

Selecting the “Archive II LDM Data” button will bring up a small window also titled “Archive II LDM Data”. From this window, the Archive II start and stop buttons control the data flowing to NCDC and external users (Figure 30 and Figure 31).

Active vs. Not Active

The “Active” status (Figure 30) means that the BDDS is up and running, which does not necessarily mean that the Level II data are being received at NCDC. For example, if the RDA was in

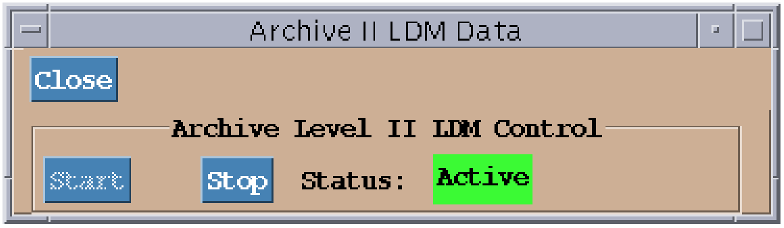


Figure 30. The Archive II LDM Data window with the data flow active.

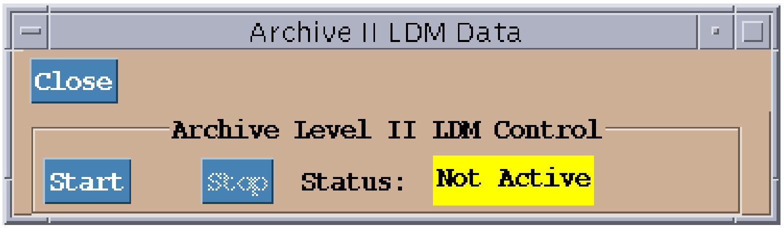


Figure 31. The Archive II LDM Data window with the data flow not active.

Standby and the BDDS was running, the status would be Active, even though there is no Base Data being generated or distributed.

7. Correction to Gage Bias Table Ingest

A radar-gage bias value can be applied at the RPG to adjust the rainfall estimates on the precipitation products. The bias value comes from a table of information generated by AWIPS, then sent to the RPG. With Build 5, an error was introduced that prevented the bias table from being properly ingested at the RPG. With Build 6, this error has been corrected and the bias value will be available at the RPG for application to the radar estimates.

8. Compression of DR, DV, and DHR Products

The Digital Reflectivity (DR), Digital Velocity (DV), and Digital Hybrid Scan Reflectivity (DHR) are large products that require significant bandwidth for distribution. Though these products are now used routinely through dedicated AWIPS lines, forecasters have also wanted access to these products through dial up (Class 2) connections.

RPG Build 6 and AWIPS upgrades now allow for these products to be available through dial up (Class 2) connections.

9. Parameter Change to EET Product

The Enhanced Echo Tops (EET) product was introduced with RPG Build 4 (Fall 2003) and became displayable on AWIPS with OB 3.0 (Spring 2004). This product was originally developed to support the FAA mission and used 10 dBZ as the threshold that defines an Echo Top, i.e. the maximum height of the 10 dBZ echo is the Echo Top.

Additional research has been conducted and this threshold will be changed to 18 dBZ with RPG Build 6. This will be consistent with the threshold used for the legacy Echo Tops product.

10. MPDA Adaptable Parameters and EPRE Exclusion Zones

There are two adaptable parameter changes with Build 6 that will require manual entry. These changes impact:

- The Multiple PRF Dealiasing Algorithm (MPDA), which uses VCP 121.
- The Enhanced Precipitation Preprocessing (EPRE) Algorithm exclusion zones.

MPDA/VCP 121

The design of VCP 121 requires 20 antenna rotations in just under 5 minutes. The associated high antenna rotation rates can sometimes result in rings of noisy velocity at the end of the first trip for each of the Doppler PRFs used. This impact is greatest where echoes have extensive areal coverage (Figure 32).

To avoid these rings, it is recommended that two MPDA adaptable parameters be edited to new default values. The parameters are the Fix Trip Minimum and Fix Trip Maximum. The recommended new defaults are -7 and -3, respectively, and ***will require manual editing***. It is also recommended that once these values are entered, select

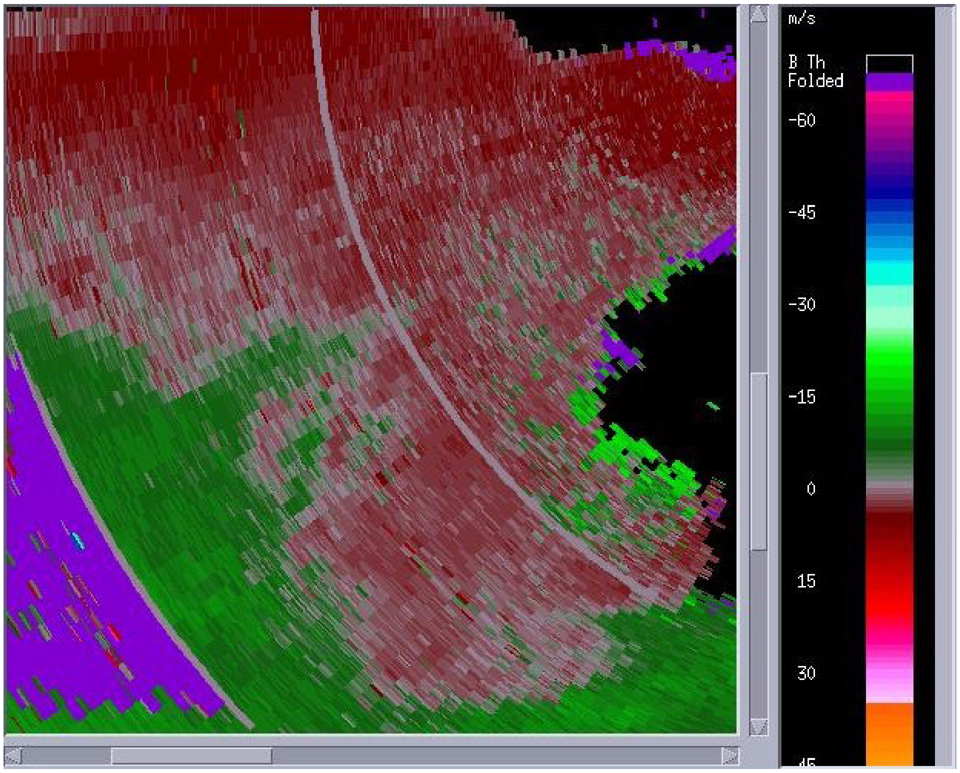


Figure 32. Velocity product from VCP 121. Note rings at first trips of the Doppler PRFs used.

the Update button in order to update the baseline (Figure 33).

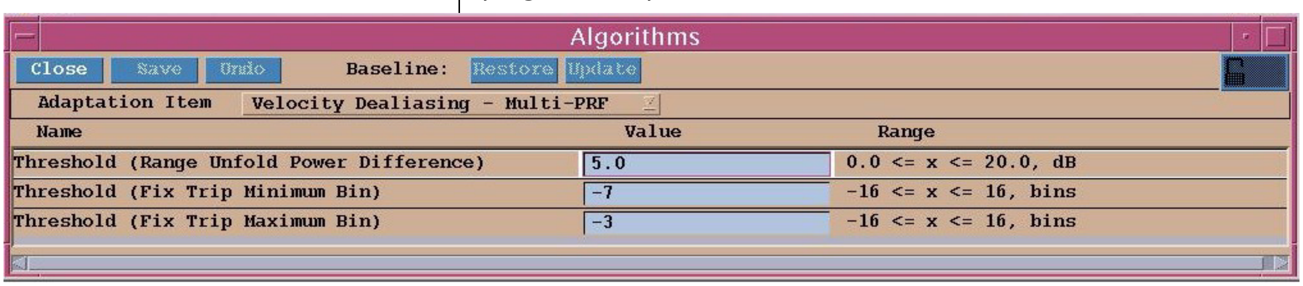


Figure 33. MPDA adaptable parameters with new defaults.

These MPDA parameter settings have provided the best results in eliminating the rings from the velocity products (Figure 34).

EPRE Exclusion Zones

The Enhanced Precipitation Preprocessing (EPRE) Algorithm was fielded with RPG Build 5. One of the changes was the automatic exclusion of certain elevation angles close to the RDA to

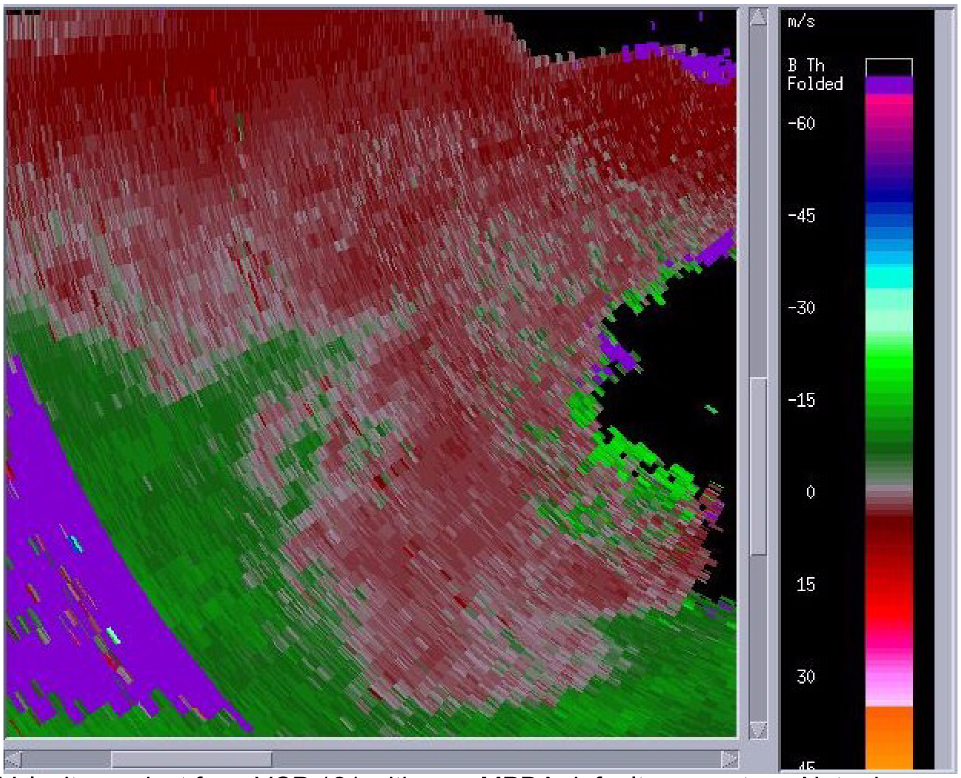


Figure 34. Velocity product from VCP 121 with new MPDA default parameters. Note rings are gone.

avoid contamination of the precipitation products from residual clutter. Specifically,

- From 0 to 25 nm, all elevations at or below 0.6° are excluded.
- From 0 to 9 nm, all elevations at or below 1° are excluded.
- From 0 to 5 nm, all elevations at or below 1.6° are excluded.

This set of exclusion zones can prevent contamination of precipitation products by both normal and transient clutter. In Figure 35 and Figure 36, these concentric exclusion zones close to the radar have prevented sea clutter from contaminating the STP product.

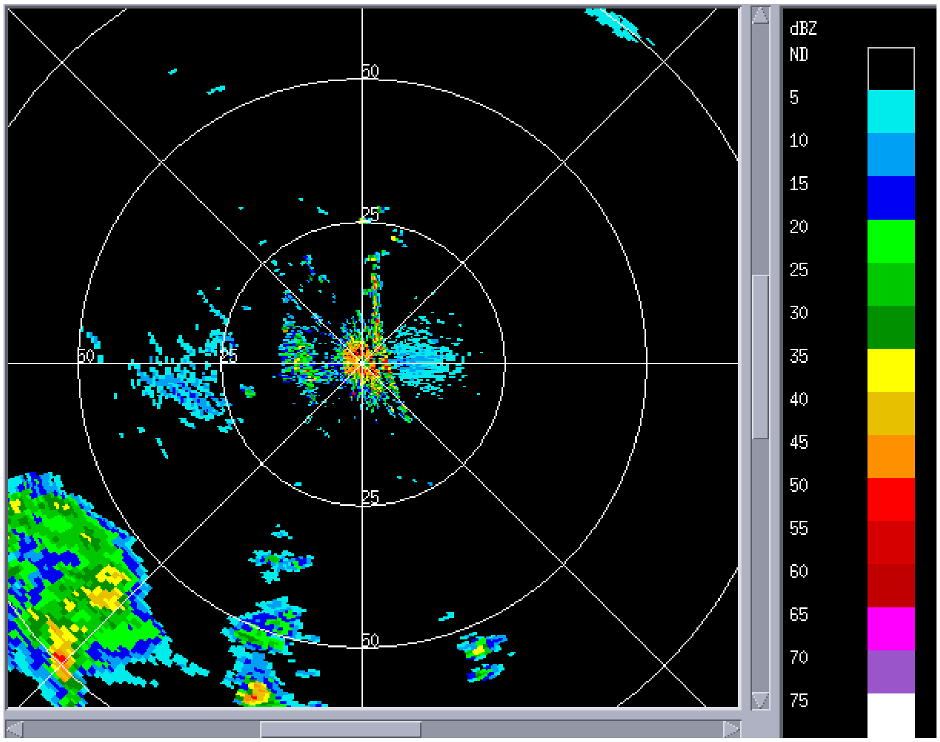


Figure 35. Sea clutter contamination in reflectivity data.

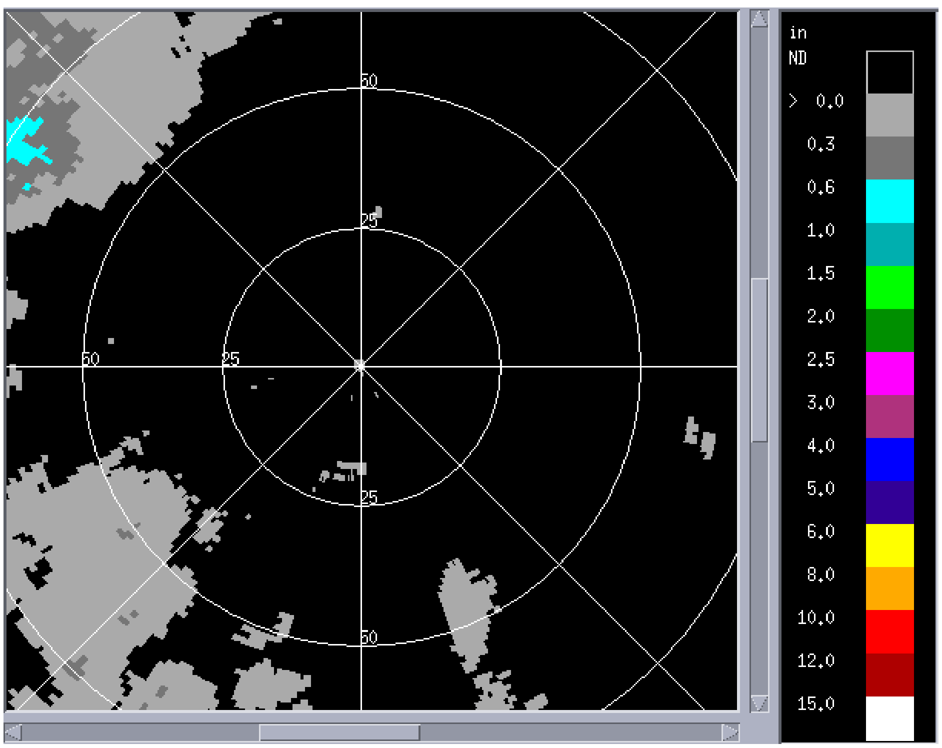
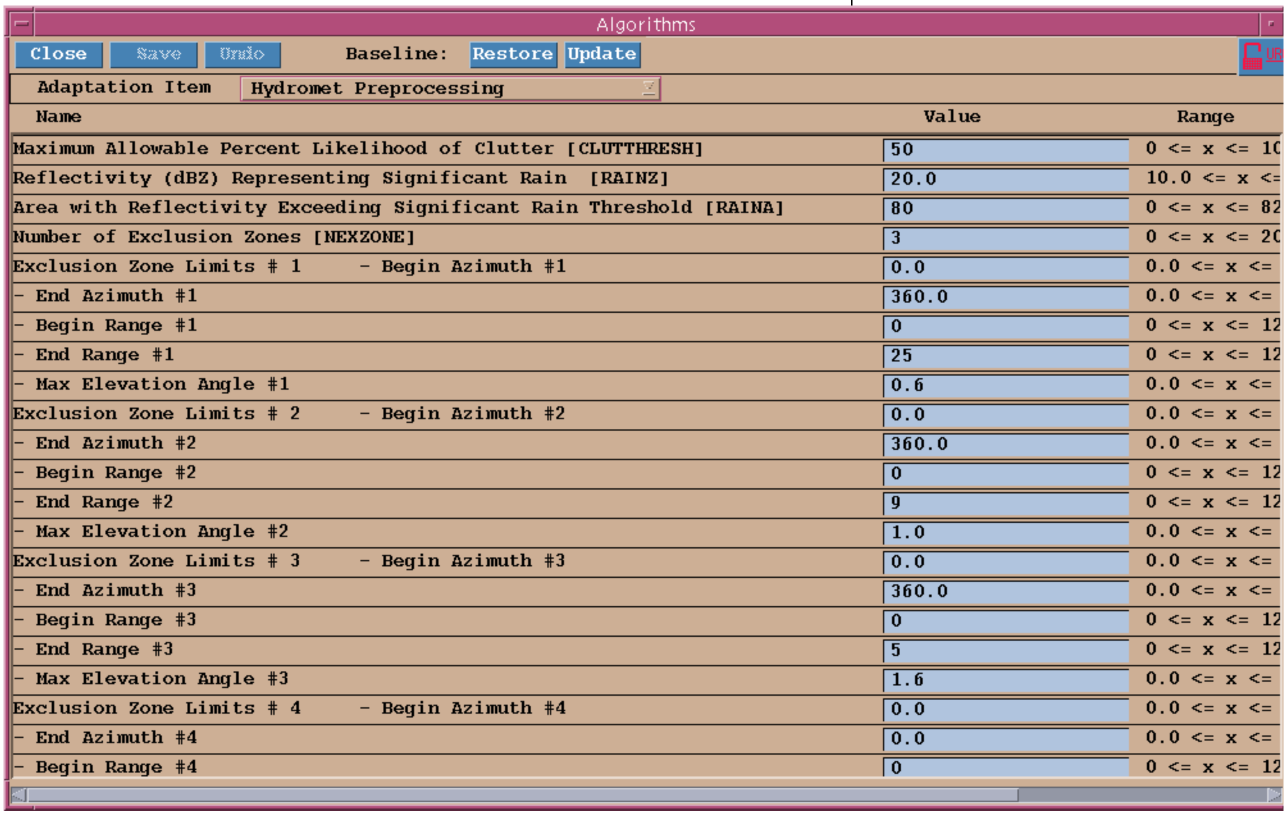


Figure 36. Concentric exclusion zones near radar prevented sea clutter from contaminating the STP.

With Build 5, these concentric exclusion zones were hard coded and not displayed among the adaptable parameters. With Build 6, these same exclusion zones are no longer hard coded and ***must be manually entered to be implemented***. To replicate the same zones from Build 5, enter the values as shown in Figure 37.



Name	Value	Range
Maximum Allowable Percent Likelihood of Clutter [CLUTTHRESH]	50	0 <= x <= 10
Reflectivity (dBZ) Representing Significant Rain [RAINZ]	20.0	10.0 <= x <=
Area with Reflectivity Exceeding Significant Rain Threshold [RAINA]	80	0 <= x <= 82
Number of Exclusion Zones [NEXZONE]	3	0 <= x <= 20
Exclusion Zone Limits # 1 - Begin Azimuth #1	0.0	0.0 <= x <=
- End Azimuth #1	360.0	0.0 <= x <=
- Begin Range #1	0	0 <= x <= 12
- End Range #1	25	0 <= x <= 12
- Max Elevation Angle #1	0.6	0.0 <= x <=
Exclusion Zone Limits # 2 - Begin Azimuth #2	0.0	0.0 <= x <=
- End Azimuth #2	360.0	0.0 <= x <=
- Begin Range #2	0	0 <= x <= 12
- End Range #2	9	0 <= x <= 12
- Max Elevation Angle #2	1.0	0.0 <= x <=
Exclusion Zone Limits # 3 - Begin Azimuth #3	0.0	0.0 <= x <=
- End Azimuth #3	360.0	0.0 <= x <=
- Begin Range #3	0	0 <= x <= 12
- End Range #3	5	0 <= x <= 12
- Max Elevation Angle #3	1.6	0.0 <= x <=
Exclusion Zone Limits # 4 - Begin Azimuth #4	0.0	0.0 <= x <=
- End Azimuth #4	0.0	0.0 <= x <=
- Begin Range #4	0	0 <= x <= 12

Figure 37. Previously hard coded exclusion zones with EPRE (Hydromet Preprocessing).

Exclusion zones were originally designed to exclude isolated areas with residual clutter from contaminating precipitation products, such as wind farms. For a review of the AP/Clutter Removal process implemented in the EPRE with Build 5, see page 27 of the Build 5 Training document:

http://wdtb.noaa.gov/modules/RPG5/index.html

The specific exclusion zones in Figure 37 are ***not required***. They were implemented in Build 5 as a generic approach to residual clutter at close range. Any ***appropriate modification*** may also be created, depending on local conditions such as terrain or wind farms close to the radar.

Rings in Precipitation Products

Under mainly stratiform precipitation conditions, the three concentric exclusion zones can cause rings of discontinuity in the precipitation products.

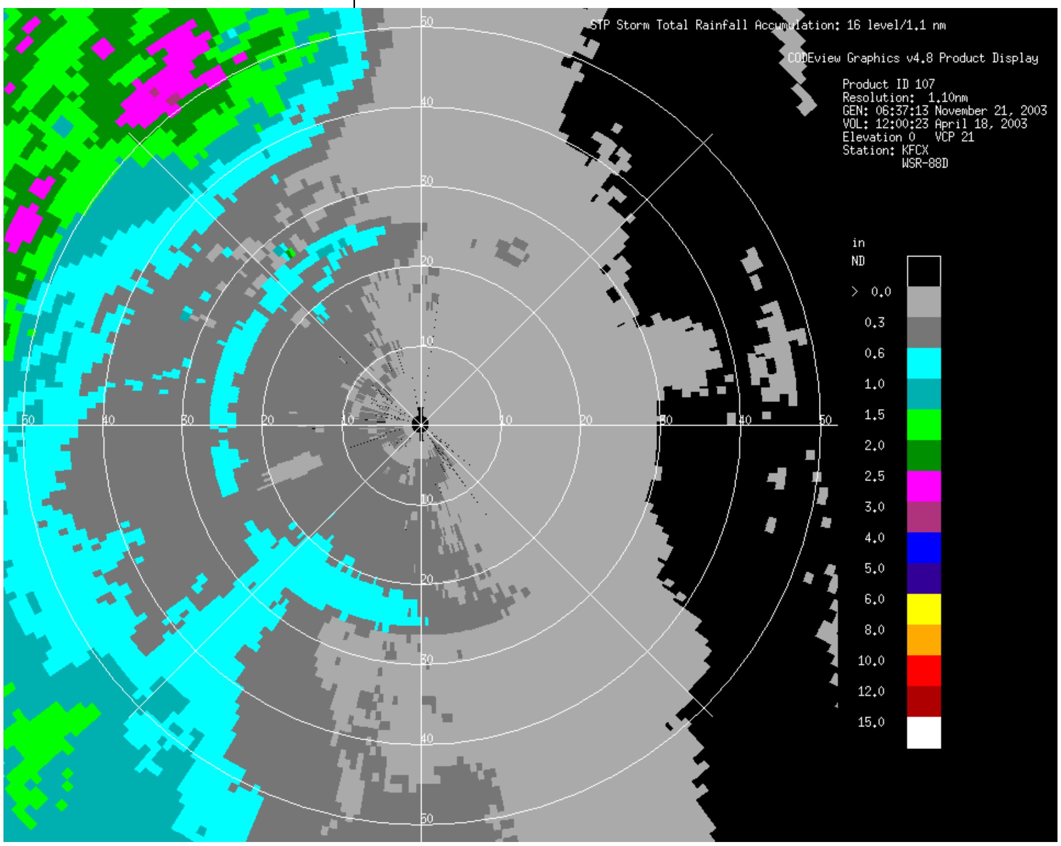


Figure 38. Rings of discontinuity in precipitation products from concentric exclusion zones.

Another change with the EPRE exclusion zones is the language concerning the specified elevation angle. The elevation angle declared for each exclusion zone is actually a maximum angle. This means that the reflectivity data from all elevations at or below this maximum angle are excluded from conversion to precipitation. With Build 6, this is more apparent with the exclusion zone editor listing “Max Elevation Angle”.

11. Build 6 Actions

There are three or four actions (depending on your site) from Build 6 that require manual intervention:

1. MPDA: enter new default adaptable parameters (page 33)

2. EPRE: enter site appropriate Exclusion Zones (page 34)
3. EPRE: enter site appropriate RAINA (page 28)

The fourth action applies to those NWS sites that operate FAA Redundant systems.

4. FAA Redundant Systems: The adaptable parameter changes outlined above must be performed on ***each channel manually***. An error has been discovered that will ***not*** allow adaptable parameter changes made to one channel to pass to the other channel.

Summary

This document provides an overview of the pre-deployment state of knowledge of the operationally relevant impacts of RPG Build 6. Some of the RPG Build 6 changes are apparent at the RPG HCI, while others will not be apparent until the fielding of subsequent AWIPS Builds.